

**INPUT
MANAGEMENT
PLANNING PROGRAM
IN
INFORMATION SYSTEMS**

VENDOR WATCH REPORT

INTERCOMPANY ELECTRONIC
DATA EXCHANGE

SEPTEMBER 1983

MANAGEMENT PLANNING PROGRAM IN INFORMATION SYSTEMS

OBJECTIVE: To provide managers of large computer and communications systems with timely and accurate information on developments that affect today's decisions and plans for the future.

DESCRIPTION:

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RESEARCH METHC

- Research top representative
- Research for this program includes professional interviews with users, vendors, universities, industry associations, and other analysts.
- Conclusions derived from the research are based on the judgment of INPUT's professional staff.
- Professional staff supporting this program average nearly 20 years of experience in data processing and communications, including senior management positions with major vendors and users.

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INPUT

**INFORMATION
SYSTEMS PROGRAM**

VENDOR WATCH REPORT

INTERCOMPANY ELECTRONIC
DATA EXCHANGE

SEPTEMBER 1983



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INTERCOMPANY ELECTRONIC DATA EXCHANGE

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INTERCOMPANY ELECTRONIC DATA EXCHANGE

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I INTRODUCTION

- Intercompany electronic data exchange (IEDE) is defined by INPUT as the electronic transfer of data or information between two or more companies or organizations.
 - This definition excludes electronic data exchange (EDE) within a company, i.e., between divisions or departments.
 - In some cases, IEDE will use the same facilities as internal EDE.
- IEDE has been growing rapidly from a small base and is on the verge of explosive growth in the next five years.
- This report provides an analysis of the current state of IEDE and focuses on the major considerations that the information systems (IS) manager should have in implementing systems that involve the electronic distribution or reception of data from another organization.
- INPUT believes that most types and sizes of businesses will be involved in one way or another with IEDE by 1990.
 - Many Fortune-1000-sized companies are already involved.
 - In some cases, even small businesses, such as neighborhood retailers, are touched by intercompany electronic exchange of data (for example, credit card purchases approved through small, specialized terminals).

- INPUT has identified many problems and opportunities that the IS manager must consider in IEDE. To a large extent they are not technical issues, but rather economic, political, social, and legal ones. Technical factors are important, but they are rarely key issues.
- Many of the key technical problems have been resolved. These include specialized terminals, networks, security, and operational reliability.
 - Refinements and enhancements to technical solutions will continue with technological advancements.
 - The IS manager is mainly confronted with a tremendous variety of choices in addressing technical problems.
- This report will make IS managers more effective in dealing with the coming flood of intercompany electronic data exchange. It will help them determine the direction IEDE systems will take and the rate at which they should be implemented.

II EXECUTIVE SUMMARY

- Note: this executive summary is designed in a presentation format in order to:
 - Help the busy reader quickly review key research findings.
 - Provide a ready-to-go executive presentation, complete with a script, to facilitate group communication.
- The key points of the entire report are summarized in Exhibits II-1 through II-8. On the left-hand page facing each exhibit is a script explaining its contents.

A. INTERCOMPANY ELECTRONIC DATA EXCHANGE GROWTH

- Intercompany electronic data exchange (IEDE) has grown very rapidly for the past five years, according to INPUT estimates, but its growth has been almost without notice. There are several reasons for this.
 - Although the number of transactions has increased at a high rate, it has been from a small base.
 - Growth has been dispersed throughout many different vertical industries.
 - Many implementations of IEDE have been shrouded because they have been start-up projects, and the sponsors did not want to publicize their efforts until success was sure. Also, many early attempts were unsuccessful.
 - It is not always apparent that IEDE is being used. The airlines have been exchanging data electronically among themselves and with reservation agents for years without a great deal of fanfare. (In fact, the airlines are among the pioneers of this technology.)
 - Often, the transactions executed through intercompany electronic communications are of a proprietary nature, and the companies involved will not disclose the amount they use them.
- Efforts to implement IEDE are unconcentrated and scattered throughout a variety of applications and industries. Individual areas of use seem small and unimportant, but altogether they represent a growing and dynamic force in American and international commerce.

IEDE – A HIDDEN BUT DYNAMIC FORCE

- **Very Rapid Growth in the Last Five Years**
 - From a Small Base
 - Now a Significant Amount
- **Low Visibility of IEDE Applications**
 - Little-known Vertical-industry Applications
 - Little Publicity
 - Proprietary Communications
- **Dispersed Applications**
- **A Dynamic Force**

B. AUTOMATIC CLEARING HOUSE SYSTEM

- See Exhibit II-2.
- The automatic clearing house system (ACH) is a government organization set up primarily to effect payment transfers between banks.
 - Gradually its function has been expanded to act as a communications link between private businesses, banks, and government organizations.
 - Formed in 1974, by the spring of 1980 private sector dollar volume exceeded that of the government sector.
 - By the spring of 1983, private sector transactions surpassed the government sector's transactions.
- ACH was originally a batch system where data was exchanged on magnetic tape.
 - Today, according to the Federal Reserve Bank, electronic communication accounts for 52% of the transactions entered into the system and for 30% of the output transactions.
 - A significant portion of the system still depends on the return of paper items, but the trend is toward more electronic exchange of data.

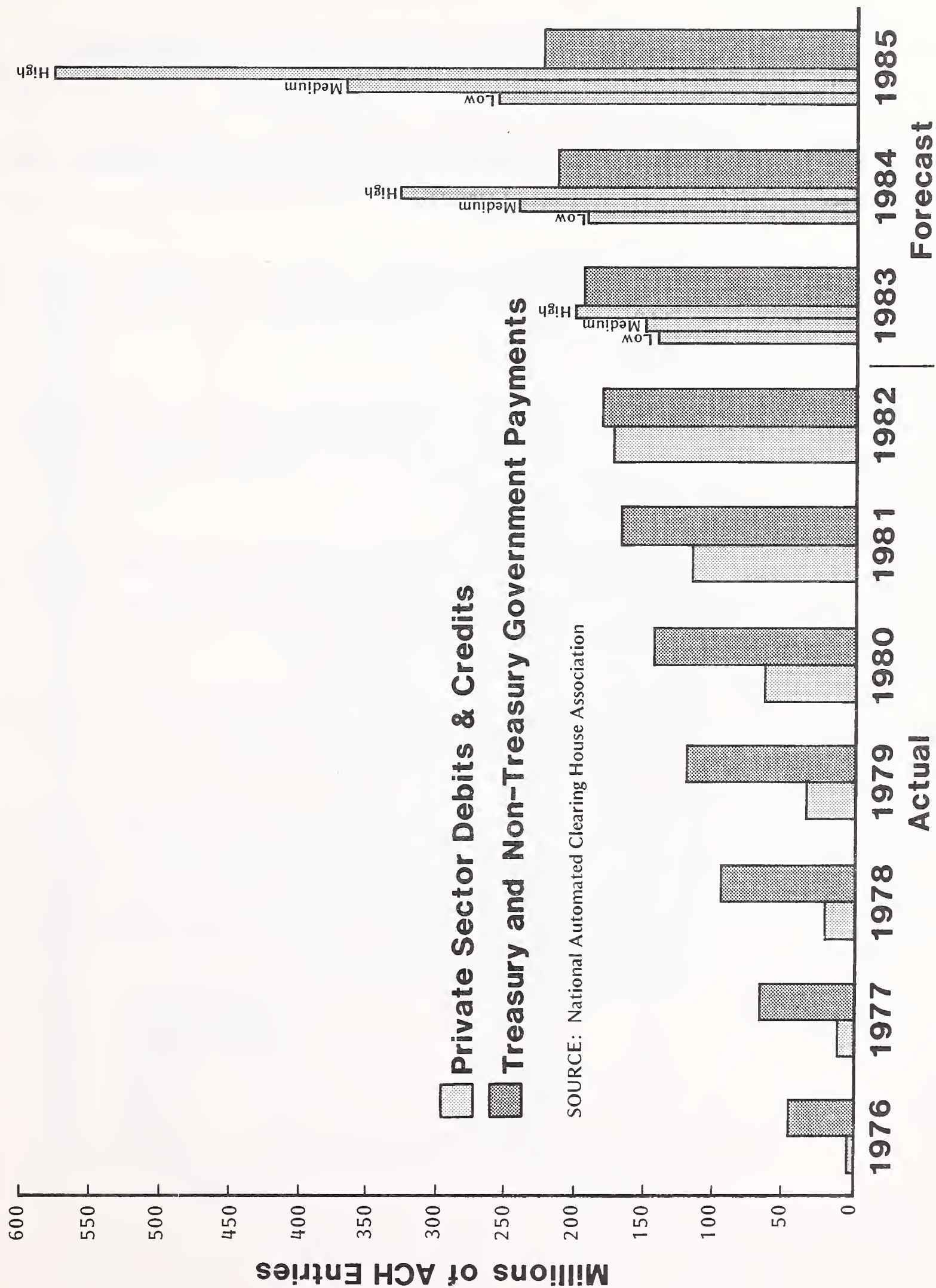
AUTOMATIC CLEARING HOUSE SYSTEM

- **Changing User Profile**
 - **Originally Only Government Transactions**
 - **Now Private Sector Exceeds Government Sector Transactions**
- **Changing Processing Mode**
 - **Originally a Batch System**
 - **Today, Nearly Half Is IEDE**
- **Future Growth**
 - **Trend toward Paperless Transactions**
 - **High Forecast Most Likely**
 - **Lower Long-line Rates Will Fuel Growth**

C. RAPID TRANSACTION GROWTH ON ACH SYSTEMS

- The forecasts shown in Exhibit II-3 were made by the National Automatic Clearing House Association (NACHA) and were provided to bidders in the private sector who are competing to take over portions of the Automatic Clearing House operation.
 - Judging from historical trends, INPUT believes that the high forecast is the most likely one for the volume of transactions going through ACH.
 - The possible 15-40% reduction in long-line telephone rates due to the divestiture of AT&T will also increase the volume of use in the next two to five years.
- One visible indication of the growth of intercompany electronic data exchange is the growth in transactions of the Automatic Clearing Houses. The exhibit shows the number of transactions (private and government) for each year from 1976 to 1982 and a forecast through 1985 provided by NACHA.
 - The lower line in 1976 represents private sector debit and credit transactions.
 - The higher line in 1976 represents Treasury and non-Treasury transfer payments.
- The compound growth rate for both government and private transactions was 40% per year for the period.

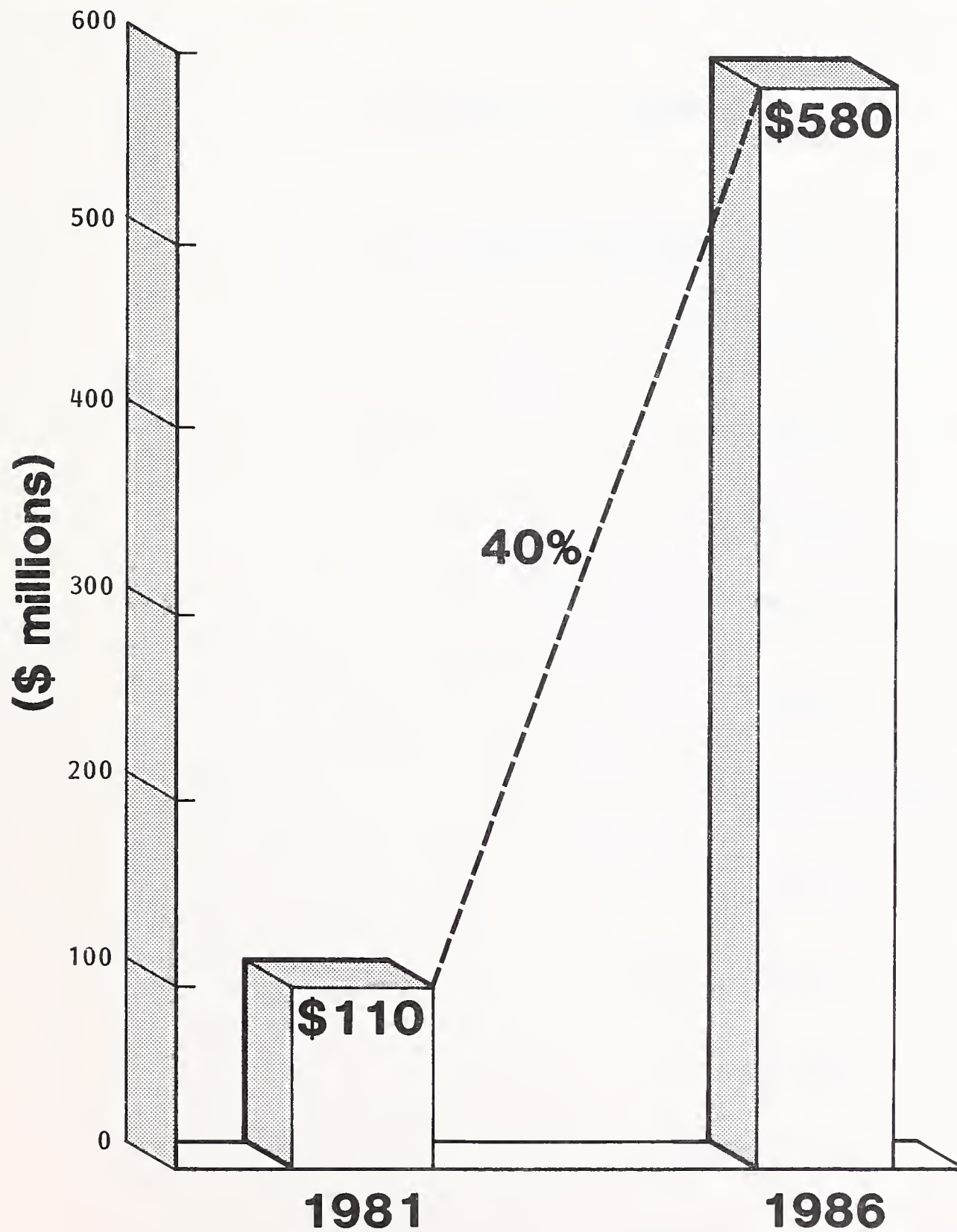
RAPID TRANSACTION GROWTH ON ACH SYSTEMS



D. GROWTH OF I & F VALUE-ADDED NETWORK EXPENDITURES

- Exhibit II-4 shows INPUT's forecast of the growth of Industrial and Financial (I&F) user expenditures for value-added network (VAN) services through 1986.
 - From a base of \$110 million in 1981, these expenditures will grow at a 40% average annual compound growth rate to nearly \$600 million in 1986.
 - Although most of these expenditures will be for intracompany communications, some of them will be for intercompany electronic data exchange.
- Another indicator of the expansion of intercompany electronic data exchange is the explosive growth of regional Automated Teller Machine (ATM) networks in recent years.
 - Nearly 3,000 of the 14,000 banks in the U.S. are now members of approximately 100 regional ATM networks.
 - The bankers are actively working on tying together nationally all of these networks and their more than 30,000 ATMs. They also wish to interface them with home and retail point-of-sale terminals and/or personal computers. Electronic funds transfer (EFT) is also expected to be added to this national network.

GROWTH OF INDUSTRIAL AND FINANCIAL VALUE-ADDED NETWORK EXPENDITURES



E. TYPES OF APPLICATIONS

- Dozens of IEDE applications are at work in every industry sector in the nation. Applications include:
 - Industry-specific.
 - Airlines.
 - Railroads.
 - Distribution.
 - Insurance.
 - Real estate.
 - Banking.
 - Shipping.
 - Cross-industry.
 - Payroll.
 - Purchase orders.
 - Invoicing.
 - Funds transfer.
 - Funds application.
 - Corporate trade payments.

TYPES OF APPLICATIONS

- **Industry-specific**
- **Cross-industry**

F. MAJOR IEDE BENEFITS

- Users are increasing sales through improved customer service, faster order filling, and quicker shipments of goods.
- Users are realizing higher profits through the increased sales and lower costs that are due to instant payments, faster communications, decreased paper-work and paper handling, decreased data entry, and greater accuracy.
- Users gain control and security of information through greater accountability and responsibility on all transactions as well as through data encryption and controlled access to the system.

MAJOR IEDE BENEFITS

- **Increased Sales**
- **Higher Profits**
- **Increased Control and
Security of Information**

G. POTENTIAL IEDE PROBLEMS

- There are some potential problems:
 - Responsibility and accountability for fault or fraud.
 - The hindrance of state and federal regulations.
 - Barriers posed by international laws.
- Informed decisions must be made concerning a number of elements in the IEDE.
 - Terminal selection must be defined by the application requirements.
 - A variety of network and communications options must be sifted through.
 - Security of the system is a vital concern for certain applications. A broad range of options is available to insure security.
- The establishment of form and content standards for an application is one of the most difficult hurdles. Fortunately, many standards have already been established.
- Over the long term, the reliability and backup facilities for the IEDE are expected to be crucial to most applications.

POTENTIAL IEDE PROBLEMS

- **Fault or Fraud**
 - **Responsibility**
 - **Accountability**
- **Government Regulations Must Be Reckoned with**
- **Terminal Selection for Application**
- **Network Options Are Numerous**
- **Security May Be Required**
- **Standards Are Essential**
- **Reliability and Backup Are Crucial**

H. CONCLUSIONS

- INPUT believes that intercompany electronic data exchange is a very important wave of the future.
- The information systems manager is advised to ride the crest by learning about the application of this new technology.
- Specifically, the IS manager, if not already doing so, should consider outputting high-volume transactions such as invoices and purchase orders to other companies electronically.
- This brief can only touch upon the major aspects of IEDE. The IS manager is urged to investigate how to apply this technology to his particular business and to evaluate its potential impact on his company.
- IEDE does not always provide benefits evenly. In some cases, there are definite losers. Some companies have launched lawsuits and antitrust actions in response to IEDE's impact on them.
- IEDE can be a driving force in changing the fundamental ways business is conducted, and these changes can be expensive. The IS manager is urged to question the impact of an IEDE application, regardless of who the sponsor may be.
- American businesses should embrace this technology, although not without prudence and planning.

CONCLUSIONS

- **IEDE Is the Wave of the Future**
- **Investigate the Many Applications**
- **Consider EDP Systems Output**
- **Beware of Problems Brought by Change**
- **There Are Many Potential Benefits**
- **Planning Is Essential to Implementation**

III IEDE APPLICATIONS SOLVE PROBLEMS

A. APPLICATION GROWTH

- IEDE is growing rapidly because it provides solutions to diverse problems.
 - Most of the solutions save time or money or, more frequently, both.
 - In some cases, time and money are not the issues; the problem can be solved no other way. The airlines reached a point at which the volume of their reservations and the number of different organizations booking reservations made IEDE the only solution. There were no alternatives.
- In researching this subject, INPUT found dozens of different IEDE applications in every sector of American commerce. INPUT believes that the reader may profit by the examples of other companies' uses of IEDE.
- Many IEDE applications use value-added networks (VANs). A value-added network typically uses common-carrier network transmission facilities and augments them with computerized switching.
 - These networks have become associated with packet-switching technology because the public VANs that have received the most attention (Telenet and TYMNET) employ packet-switching techniques.

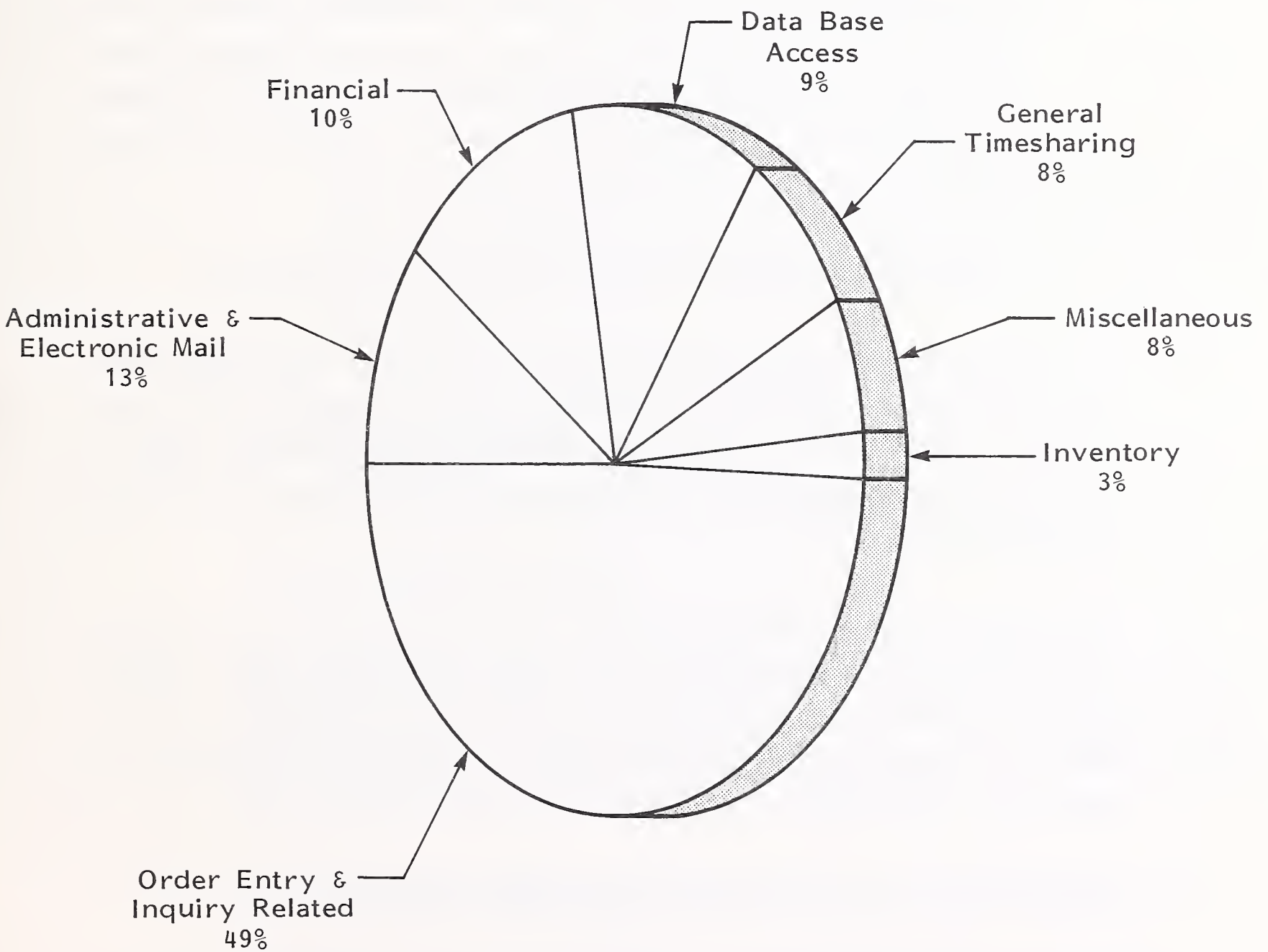
- However, other added service features such as store-and-forward message switching, terminal interfacing, error detection and correction, and host computer interfacing are also important.
- In the study Market Opportunities in Network Services, December 1982, INPUT identified how a sample of users (18 companies whose revenues exceeded \$1 billion in 1981) used VAN services.
 - Excluding remote computing service (RCS) users, Exhibit III-1 shows 1982 industrial and financial users' expenditure distributions for VAN services by application.
 - Although a breakdown of intracompany and intercompany applications was not obtained for this study, INPUT believes that a growing portion was intercompany.
- The type of use shown in the exhibit generally represents IEDE use within private-company-owned networks, except that many private networks are very specialized and, at least initially, dedicated to a single purpose. The more advanced and/or newer private networks are more multipurpose and reflect the diversity of applications similar to public VANs.
- The remainder of this chapter reviews various major applications of intercompany electronic data exchange applications (although some applications are also heavily used intracompany).

B. ELECTRONIC MAIL

- Electronic mail (EM) is a range of services that transmits text and graphic materials.

EXHIBIT III-1

EXPENDITURE DISTRIBUTION BY APPLICATION FOR VALUE-ADDED
NETWORKS BY INDUSTRIAL AND FINANCIAL USERS IN 1982



- Communicating by paper is rapidly becoming more expensive than electronic communications.
 - This applies to all types of communications, from simple memos to complex purchase orders and freight forwarding paperwork.
 - Many business documents are produced by computers, transmitted on paper to another organization to be re-entered into a computer system, and then they are processed into another piece of paper to be transmitted back to the originator who enters the response into his computer.
 - It is obvious that there are some inefficiencies in this process.
- The cost of mailing a first-class letter today is 20 cents. Some businessmen joke that 5 cents of this cost is for shipping and the remaining 15 cents is for storage. But it is not a joking matter that postal costs are increasing and delivery times are lengthening. Businesses are therefore looking to electronic mail for solutions.
- The cost of sending a 20-page document across the country by EM is less than two dollars, which is less expensive than using Express Mail or other overnight delivery services, a fact U.S. businesses seem to be increasingly aware of. INPUT estimates that U.S. companies spent over \$500 million on all forms of electronic mail in 1982.
- Sending a short message by EM can cost as little as 30 cents.
- EM saves secretarial costs when the message is going many places. Instead of drafting a version of the message for each destination, the secretary need produce only one version. It is then transmitted to a selected distribution list stored in the system, such as a list of local sales office managers.

- Savings on management time can also be considerable when messages are stored in a computer file for later retrieval or data analysis. Savings on absolute time are also significant when responses to messages can be almost instantaneous.
- EM is also self-documenting, whereas the telephone is not. The speed of EM is comparable to a telephone but EM can cost significantly less.
- EM not only reduces letter costs but also phone costs.
 - Many executives find it easier to drop a letter into an electronic mailbox than to find that "they are in meetings" or "out to lunch." Executives pay for that information with their own time as well as paying the phone charges.

C. ELECTRONIC FUNDS TRANSFER

I. VARIETY OF APPLICATIONS

- Electronic funds transfer (EFT) is a generic name that describes a variety of applications involving funds and IEDE. As used here, the term describes any electronic transaction whose sole purpose is to effect the transfer of funds from one organization to another.
 - Following is a list of EFT systems with a review of their applications.
- ### 2. NATIONAL AUTOMATIC CLEARING HOUSE ASSOCIATION (NACHA)
- NACHA is a consortium of regional automated clearinghouse associations.

- Its members include about 13,000 member bank and thrift organizations and approximately 10,100 companies.
 - It provides the standards and rules for automated clearing house transactions.
 - It also maintains a system of exchange and settlements of entries between regional ACHs and their members.
- NACHA basically provides a means of electronic funds transfer between its members and other organizations and individuals with whom they transact business, including:
 - Private sector debit and credit transactors.
 - These transactions include direct deposit of payroll, pension and annuity payments, preauthorized insurance premium payments, and corporate trade payments.
 - These sector transactions have been growing at an average annual compound growth rate of 85% from 1976 to 1982.
 - Treasury and non-Treasury government transfer payments.
 - These transactions include Social Security and Medicaid payments, Treasury disbursements, and payments by other government agencies such as the Department of Education.
 - These government sector transactions have been growing at an average annual compound growth rate of 24% from 1976 to 1982.

- Users of the system benefit from the lower cost of executing transactions and from the higher speed with which they are accomplished. The growth in use of the system (shown in Exhibit II-3) is one measure of its effectiveness.
- Plans are in place to dramatically expand the uses of ACH.
 - In 1983 NACHA intends to test ACH use by corporations in electronic cash settlements and invoice handling.
 - About 50 corporations will participate in the pilot corporate payments program.
 - Companies that will participate in the test include Westinghouse Corporation, Black and Decker, Xerox, and Pittsburgh Plate Glass.
- The Federal Reserve Bank operates 31 of the 32 regional ACH systems. Only the New York ACH is privately operated.
- NACHA is challenging the Federal Reserve Bank by inviting private sector companies to bid on a request for proposals for a national processing project. Interested vendors include VISA, SWIFT, IBM, NCR, Tymnet, and Telenet. As many as 20 companies may bid on the project.
- INPUT believes that this system may evolve into the largest IEDE system in the world.

3. FED WIRE

- Fed Wire is operated by the Federal Reserve System for the benefit of its member banks. It provides EFT for user banks and greatly reduces the physical movement of funds among banks.

4. BANK WIRE

- Bank Wire is an EFT system used among banks for transactions that exclude the Federal Reserve as an intermediary.
 - It also serves as an electronic mail system and interfaces with TWX.
 - It will soon be able to interface with ACH.

5. OTHER EFT APPLICATIONS

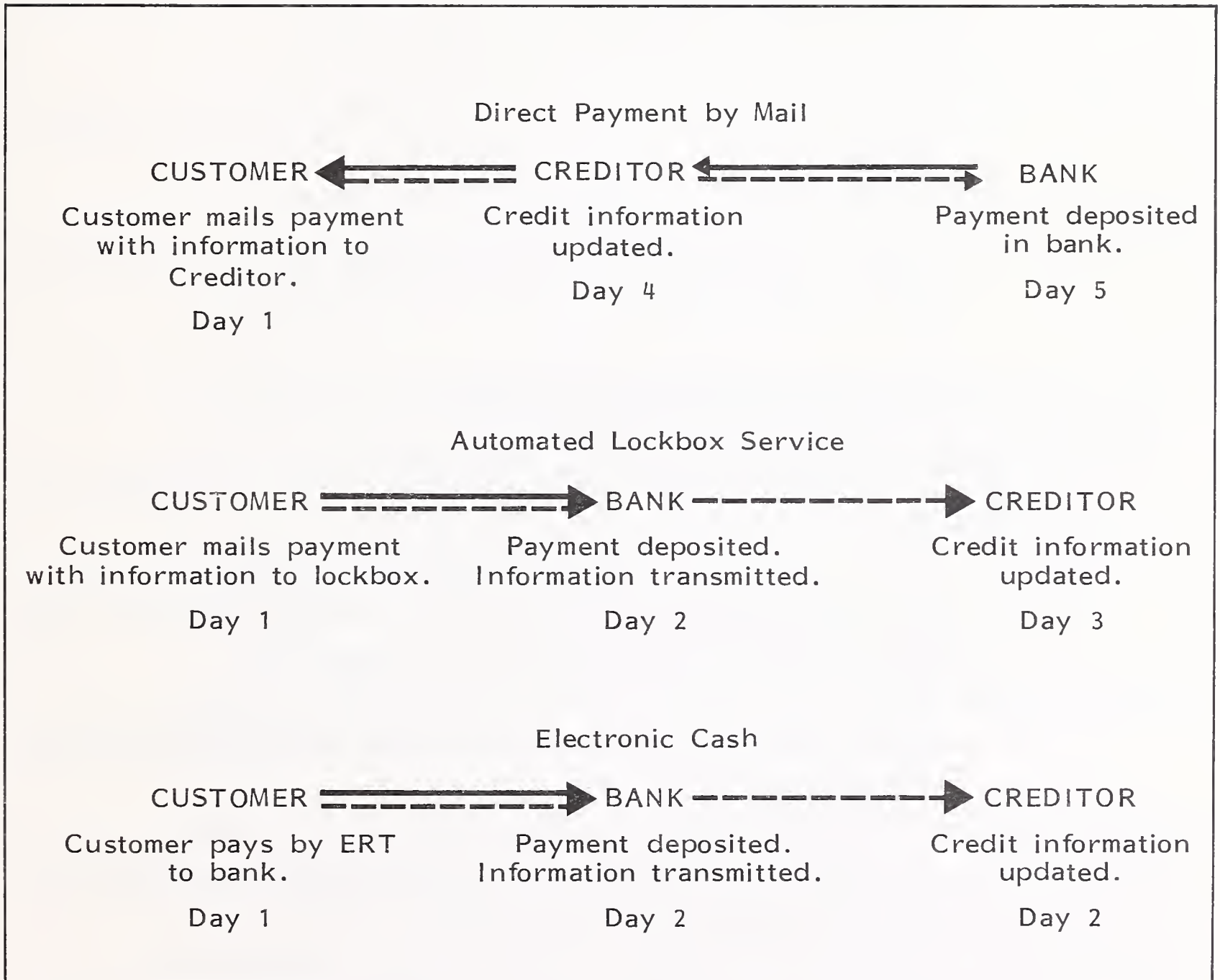
- Clearing House Interbank Payments System (CHIPS) is an automated network system for the clearing and settlement of domestic and international payments through the Federal Reserve.
- Society for Worldwide Interbank Financial Telecommunications (SWIFT) is a cooperative bank EFT system that transfers funds worldwide and also provides EM.

D. ACCOUNTS RECEIVABLE IEDE SYSTEMS

- Accounts receivable systems are on the verge of entering the IEDE age. Exhibit III-2 illustrates in a simple way this evolution from a manual system to a fully electronic one.
- Payment and application of funds to accounts receivable in the simplest form are shown as direct payment by mail.
 - Customers mail their payment to the creditor. The creditor credits the customer's account and deposits the funds in its bank account.

EXHIBIT III-2

TYPES OF ACCOUNTS RECEIVABLE SYSTEMS



Legend: — Funds
----- Information

- This takes five days for the creditor to process and for the customer to start receiving interest on the payment.
- Payment using an automated lockbox service (ALS) is shown next.
 - The customer mails his payment to a lockbox, which is a post office box close to the mailer and accessible by a bank.
 - The bank processes the payment and credits it directly to the creditor's account.
 - The bank then provides a report of the transactions to the creditor on magnetic tape or on-line.
 - This process usually takes three days.
- Automatic Electronic Cash Application is the final stage of development of this process.
 - In this process the customer electronically forwards the payment to the bank, as planned for in the NACHA test discussed above.
 - The bank credits the account and electronically notifies the creditor of the transaction.
 - The creditor processes the information through his accounts receivable system and updates the client's account.
- This ultimate step in payment automation is now possible because standards have been established that permit effective communications between the customer, the bank, and the creditor.

- NACHA and the American National Standards Institute (ANSI) have established preliminary standards for intercompany electronic data exchange of payment information.
 - The customer's accounts payable system can now format its payment data automatically according to established standards.
 - The creditor's system will be able to automatically apply the payments to specific invoices and items within its accounts receivable system.
 - The benefit to both the paying and receiving organization is a savings in time and a reduction in handling cost. Credit information will be more current and float will also be reduced.
- IS managers should adopt these standard formats in their systems today. They should also evaluate how these advances in IEDE can benefit their companies.

E. AUTOMATIC TELLER MACHINES

- ATMs are essentially terminals that replace many of the functions of human tellers.
- ATMs are now linked together in about 100 different regional networks. These networks provide for the electronic exchange of data between customers and their banks. There is a trend for many of these networks to be tied together in larger networks. Bankers, for example, are currently exploring ways to interface the regional networks into a national network.
- Unlike the ACHs, ATM networks are real time, linking consumers directly to their bank's computer. The key benefit to the banks is reduced cost.

- Conventional over-the-counter banking transaction costs go up with increases in volume.
- ATM costs are largely fixed so the transaction cost declines with increases in volume.
- Long-term prospects for economic benefits from ATM also look bright.
 - The cost of labor will at least keep pace with inflation and is unlikely to decline.
 - The cost of electronic hardware is projected by INPUT to continue to decline at as high a rate in the future as it has in the past.
- Banks estimate that they save from \$0.20 to \$2 per transaction with ATMs as opposed to human handling of a transaction.
- In California nearly 35% of consumer banking is done through ATMs, and use is increasing rapidly as banks provide a variety of incentives to users, including chances for trips to Hawaii.
- As the equipment and software cost of ATMs are amortized, the benefits to banks will be even greater.
- Consumers are finding the machines more convenient than tellers once they have had some hands-on experience. Banks are providing incentives to customers to overcome initial reluctance to use them.
- The ATM networks will have a profound impact on the rest of the nation's commerce.
 - They are an excellent vehicle for electronic funds transfer from retail point-of-sale (POS) terminals.

- It is relatively transparent to the ATM network whether it is dealing with an ATM or a POS transaction.
- Many ATMs are conveniently located near retail centers.
- ATM networks will soon permit at-home transactions through personal computers and/or videotex devices.
- ATM networks will likely interface with public VANs, ACHs, and a variety of private networks owned by the likes of J.C. Penney, American Express, Merrill Lynch, and United Airlines.

F. POINT-OF-SALE ELECTRONIC FUNDS TRANSFER

- The electronic transfer of funds from a consumer to a retailer through a bank is a reality today. In Des Moines, for example, the Iowa Transfer System, a statewide ATM network, and Dahl's Foods, Inc., a supermarket chain, have set up a system that allows customers to pay for their groceries by using a debit card to transfer funds from their bank account to the retailer's.
- Potential benefits to retailers are numerous:
 - Cash flow is improved through instant access to the buyer's funds.
 - The risk of accepting bad checks or charges is reduced.
 - Check processing charges are reduced from approximately \$1 per check to \$0.30 to \$0.40 per electronic transaction.

- Whether or not retailers will fully realize these benefits is not yet clear: banks and consumers are going to want their share of the benefits also.
- Future developments of point-of-sale electronic funds transfer (POS EFT) are up for grabs.
 - Major retailers like J.C. Penney's and Lucky Stores are anxious to realize the benefits outlined above and may not wait patiently for the banks to implement these systems.
 - Third-party vendors like NCR and EDS are also looking to play major roles in what INPUT considers to be a dramatic growth opportunity in IEDE.

G. ELECTRONIC PURCHASE ORDERS AND INVOICES

- Intercompany electronic data exchange has made much progress in the retail food industry.
- Ralph's Grocery Company, a Los Angeles-based supermarket chain; Super Value, a Minneapolis food wholesaler; and 11 other companies have set up a system to electronically transmit purchase orders and invoices to each other.
- The system has been operational for over six months, and the participants are realizing many benefits.
 - Purchase orders are transmitted immediately and acted upon without re-entry into the seller's computer.
 - Order status can then be quickly checked by the buyer.

- The buyer is able to reduce reserve inventory or safety stock, thus reducing the cost of carrying inventory.
- Paperwork is reduced for the seller.
 - All purchase information is provided by the buyer.
 - The seller's system simply assigns prices to the order after the shipping clerk verifies that the items have been shipped. The system then generates an electronic invoice and sends it to the buyer's computer.
- The buyer's and seller's systems are able to electronically exchange data because the purchase orders and invoices are transmitted in a common language known as the Uniform Communication Standard (UCS) developed by the Transportation Data Coordinating Committee (TDCC).
 - TDCC, based in Washington, is a nonprofit industry association sponsored by major shippers and carriers. It was established to develop electronic communication standards for the transportation industry.
 - TDCC provides the software and training programs for the use of UCS.
- The American National Standards Committee X.12 has also developed standards for electronic purchase orders and invoices. The Credit Research Foundation, Lake Success, New York, is also involved in the development of these standards.
- Tymshare offers two services of value to manufacturers, distributors, and retailers.

- Tymshare Information Exchange Service (TIES) is a proprietary Electronic Data Interchange (EDI) service based on that firm's EM capability; it distributes messages in the UCS format.
 - . Distributors can use the system to communicate with virtually any other party, regardless of the type of system they have.
 - . TIES functions essentially as an electronic post office for companies with a need for IEDE.
- The other service is Tymshare's Universal Translation Service (TUTS).
 - . TUTS will translate one standard format into another standard format.
 - . This service is used by companies who have developed their own standard format but have a need to communicate with other companies through UCS, another standard format, or the other company's proprietary code. TUTS will perform the translation, as well as communicate the message over Tymshare's network, Tymnet.
 - . TUTS currently is set up to handle about a half a dozen industry/application message standards, including the ANSI standard sponsored by the X.12 committee. Tymshare is receptive to adding more in cases where a need is demonstrated.
- It should be noted that Tymshare also offers general electronic communications services on Tymnet and also will sell and install private networks for clients.

H. ELECTRONIC WAREHOUSE SHIPPING ORDERS AND ADVICES

- TDCC has also developed standards for electronic communications between manufacturers and warehouses. The Warehouse Information Network Standards or WINS.
 - The WINS standards are compatible with the UCS standards.
 - A major benefit will be the elimination of a large array of various printer terminals that are supplied by manufacturers to warehouses and on which orders are received. By using WINS, all orders may be received on one terminal.
- The warehouse industry is also trying to establish standards to link warehouses with common carriers.
 - Electronic standards for freight bills and bills of lading will provide a number of benefits.
 - Public warehouses could receive retailer purchase orders for a variety of manufacturers' products and could consolidate all orders into one freight shipment.
 - Freight and time savings would be significant.

I. EXPORT IEDE TRADE SUPPORT SYSTEMS

- The National Committee on International Trade Documentation (NCITD), a nonprofit export trade group, sponsored a pilot test of the Cargo Data Interchange System (CARDIS) in 1981.

- The system was designed to electronically exchange the dozens of documents that are circulated among the numerous parties involved in international trade transactions.
 - The pilot test was performed on Tymshare's remote computing service.
 - A dozen companies including shippers, ocean carriers, and freight forwarders were involved in the test.
 - NCITD announced the test was a success, but little additional work has been done.
- Several companies offer services or systems that use IEDE to some extent in Trade Support Systems. Trade Support Systems provide most of the data processing required for trading.
 - Cyber Data Software, Inc. sells a system for export control that can work with Tymshare's TIES network.
 - Harper, Robinson & Company, a San Francisco-based ocean forwarding and customhouse brokering firm, offers a service called Inventory Tracking System to its clients. This service allows the client direct access to information on its shipments.
 - Users benefit from these systems by having greater control over their inventory, better monitoring of their distribution systems, and a tremendous reduction in paperwork.
 - Some of the systems perform language as well as currency translations and compute the most cost effective shipment routes.

J. FREIGHT CAR TRACKING SYSTEMS

- A number of companies offer services that enable shippers to monitor the progress of their shipments through the nation's railroad system.
 - The American Association of Railroads supplies data on railroad car status through RAIL, Inc.
 - The data is provided in a standard format established by the National Industrial Traffic League (NITL).
 - Tymshare offers a service called RAILTRACK, which enables clients to track their shipments and analyze their performance by measuring their progress against established plans.

K. INSURANCE VALUE-ADDED NETWORK (IVAN)

- Over the years, a number of insurance companies have set up systems to electronically communicate with their independent agents' systems. But most of the efforts were not very successful, since the agents had to deal with a variety of insurance companies and systems.
- The problem seems to have been resolved through the efforts of the Insurance Institute of Research (IIR), an organization with 22 insurance company members, whose purpose is to help the industry automate their operations.
- In 1982, IIR awarded a contract to IBM to install an IEDE network that links insurance companies and independent agents nationwide (the Insurance Value-Added Network or IVAN).

- The IIR has established standards for the communication of the various forms that are involved in writing up policies.
- Eventually the system is expected to serve about 200 insurance companies and about 60,000 agencies.
- A key benefit of the system will be the reduction of policy writing time from weeks to overnight.
- Another benefit will be the reduction of the 15-18% average error rate in writing policies.
- In addition to the cost benefits derived from the above, the customer will receive faster and more accurate service.

L. REAL ESTATE IEDE APPLICATION

- The National Association of Realtors has established a national IEDE network called the Real Estate Information Network (REINET).
- REINET enables independent realtors to exchange information on properties throughout the country.
- In addition to providing listing and screening capabilities, the network allows agents to deal with each other through its EM capabilities.
- Members benefit by having quicker access to a greatly expanded market.

M. AIRLINE IEDE APPLICATIONS

- Probably the oldest intercompany electronic data exchange system is sponsored by the Societe Internationale de Telecommunications Aeronautiques (SITA).
 - SITA was founded in 1949 and originally communicated Morse code messages by radio-telegraph between airlines.
 - Today SITA is one of the most complex specialty VANs in the world and serves over 240 member airlines.
- Members may interface with SITA through individual terminals or through their own in-house reservation computer systems.
- SITA-based applications could not be accomplished without IEDE.

N. CONCLUSION

- It should be evident from the above sample of applications that there are numerous opportunities to implement intercompany electronic data exchange. Implementation could provide benefits in a variety of ways.
- The examples given also suggest opportunities for acquiring more information about implementing specific IEDE applications.
- IEDE will be a major force in American commerce in the 1980s; information systems managers should anticipate and plan for how it will affect their companies and operations.

- Furthermore, in order to take advantage of the obvious benefits cited above, IS managers should initiate plans for developing IEDE applications on their own systems.
- The implementation of IEDE applications is not without perils and pitfalls. The next few chapters will focus on some of the more salient problems that the IS manager may encounter.

IV LEGAL PROBLEMS

A. RESPONSIBILITY FOR FAULT OR FRAUD

- Many IEDE applications involve the exchange and/or movement of tangible property.
 - Electronic funds transfer and other financial transactions include the exchange of substantial sums of cash, both individual transactions and the day's total transaction volume (e.g., ATMs).
 - Order entry, purchase orders, shipping bills, and similar transactions involve the exchange of physical properties that are also of considerable value.
- In such an environment, through the fault of one or more of the participants, tangible, valuable property may end up in the hands of another party not contemplated in the transaction. When valuable goods are transferred, there is also the opportunity for fraud.
- In any case, the question arises as to who is responsible and who will redress the problem. This is an important issue that should be addressed early, before design or implementation of the IEDE system takes place.

- Many of the procedures implemented in the system must be designed to prevent fraud or faults in the execution of a transaction.
 - System design should not commence until these issues are resolved.
 - Procedures and protocols involving the exchange or delivery of property should be reviewed by the firm's attorneys before proceeding with implementation.
- A large number of precedents have been established that define legal responsibility in existing applications.
 - These precedents differ from state to state and nation to nation.
 - The systems designer must contemplate how far the network will extend and determine future requirements based on its full extension.
- Solutions to the responsibility problem involve a combination of legal and technical considerations as well as agreements among the parties involved.
- In addition to obtaining legal approval for a system, it might also be wise to consult with insurance companies because of the risk that plans might go awry.

B. INTERSTATE PROBLEMS

- Some areas of commerce are heavily regulated within the United States. Banking and insurance are two examples. There are potential problems when IEDE crosses state lines.

- When ATM networks crossed state lines, the banking industry encountered a number of legal questions regarding interstate banking and federal regulations.
- The insurance industry faces the problem of getting the insurance commissioners in all 50 states to agree to their plan for interstate transactions that are handled by IVAN.
- Under certain circumstances that may differ from state to state, some transactions are subject to state and/or local sales/use taxes.
- For the most part, none of the potential problems in doing interstate business with an IEDE will differ from those of a manual or a semi-automatic system. There are still areas of concern for the IS manager.
 - The IS manager should be sure that all of the above bases are covered.
 - The IS manager should also remember that a new system may very well introduce new problems.

C. PROBLEMS AT THE BORDER

- Interstate problems will seem insignificant when compared to international problems. Commerce between nations is much more regulated, monitored, and controlled than is interstate commerce. At risk is the economic welfare, sovereignty, and security of the nations concerned.
- Many nations are nearly paranoid about data flowing across their borders. This is the case when the data is merely informational. When the data also involves the transfer of physical property, the concern can be elevated to the level of hysteria.

- Many nations have recognized that information has become a tangible good with an associated economic value. Because of the value of the information, the sovereign nations that control the marketplace also want to control the information and its distribution within their borders.
- Another problem is the issue of privacy laws, which differ substantially from country to country.
 - Many countries have laws designed to protect the privacy of the individual. These laws restrict the kind of information that may be sent beyond their borders and stored in a system located in another country.
 - Some countries interpret their privacy laws to apply to corporations as well as people.
- There is also the issue of national security.
 - Many applications require as a security precaution that all or part of a transmitted transaction be encrypted.
 - This runs counter to the desires of the many nations that desire to inspect these transmittals as they cross their borders. This is especially true where financial transactions are involved.
- Finally, there is a strong wind of protectionism blowing across the world today. Information processing is a business that generates billions of dollars of revenue for the nations in which the work is performed.
 - A government is not likely to be pleased if an appreciable amount of its payrolls are processed in another country.

- West Germany, for example, has severe restrictions on data processed outside of the country and then imported.
- The problems of sending data across the border are not limited to intercompany electronic data exchange; they also apply to intracompany exchanges.
- The best approach to identifying and solving these international problems is via the establishment of cooperative joint ventures with foreign companies residing where one wishes to do business. In some cases that is not only wise but is mandated by law. American companies should also work together by forming trade or special interest groups that are concerned with the implementation of international IEDE applications.

V TECHNICAL ISSUES

A. TERMINALS

- IEDE systems can be accessed from both secured or nonsecured terminals. Within each category there are many variations, but each category has its identifying characteristics.
 - Secured terminals are devices that require a physical key to operate the terminal and gain access to the system.
 - The most commonly encountered secured devices are ATMs, which require the insertion of a card that is magnetically encoded with identifying information. The card is, of course, the key.
 - Most secured terminals also require the entry of a password or personal identification number (PIN).
 - Secured terminals are usually physically armored to prevent penetration. This protection may be present to prevent access to the contents of the terminal (which might be cash). Or it might be armored simply to preclude unauthorized access to the system.

- A well-secured terminal will also have electronic interlock devices which will render it useless and inoperable if the device is penetrated.
- Nonsecured terminals may be operated by anyone who has physical access.
- Aside from financial systems that dispense cash, most terminals used in commercial applications are unsecured.
- Most systems provide for security within the IEDE network.
- Many companies have designed and installed IEDE systems with terminal devices that are locked into their system.
 - Some terminals are hardwired into networks and cannot be used for any other application.
 - Other terminals are for special purposes and have special features that preclude their use for other applications.
 - The result is a proliferation of office terminals that sometimes work for only a few hours a day. This is a very inefficient use of hardware; it also requires a lot of space.
 - The use of secured and special-purpose terminals should be avoided unless they are absolutely essential to the application.
 - Many potential users of the system may be put off by having to make room for just one more terminal.
- Ideally, an IEDE should allow for access by any electronic communicating device, be it terminal, computer, or node. The trend in communications appears to be toward versatility.

- Like telephones, terminals should be usable by a variety of people for a variety of applications. However, if the application requires a pay phone, use a pay phone.
- In most application systems, unsecured terminals will prevail because of the enormous installed base of such devices. These terminals provide an immediate and broad base of accessibility.

B. NETWORK DESIGN

- Ideally, networks should be independent of the host computers that are interfacing with them. Network independence is a desirable feature for the following reasons:
 - Intersystem communications are greatly enhanced by network independence.
 - A well-designed independent network will speak many languages or use protocols that permit any host to speak any other.
 - Independent networks are generally transparent to the users' data stream and thus have virtually no limits to their use and application.
- Most public data networks are independent and share the characteristics cited above. Unless there are compelling reasons to do otherwise, private networks should also be independent.
- Independent networks are more expensive than host-controlled networks but provide for a great deal more flexibility, expansion, and enhancement.

- If a business cannot afford its own independent network, it should seriously consider sharing a public network.
- IS managers should consider using the next generation of networks for their IEDE applications. These new networks are termed High Value Added Networks (HIVAN).
 - A HIVAN is a dual-level, intelligent network.
 - It superimposes an on-line, application-oriented process on a transparent packet-switching independent network.
- A HIVAN may be constructed using a public or private VAN.
- Tymshare's TUTS service is an example of a HIVAN. TUTS performs substantial protocol conversion, message and/or language translation, and storage functions under Tymshare's host processors.
- GTE's Telenet, IBM's Information Network Service (INS), and American Bell's Net 1 offer similar capabilities.
- IS managers should consider the capabilities of all public VANs when contemplating the implementation of an IEDE system.
 - Savings might be realized by capitalizing on the investments made by VANs.
 - New capabilities and offerings are being added to these services continuously; some of them might address one's specific problem very appropriately.
- In sum, networks are required for most IEDE applications. Networks are complex and expensive. Explore alternatives before making a decision to proceed.

C. SECURITY

- IS managers should determine the level of security needed for IEDE applications.
 - Most communications between companies are relatively unsecure.
 - Communications through the mail or by telephone are easily penetrated by outsiders.
- Do IEDE communications require a higher level of security? In many cases they do not.
- If security is of high concern, as it should be in an EFT system, then a number of factors should be considered.
 - The weakest element in an IEDE system is the computer.
 - The next weakest element is the terminal.
 - The strongest element is the communications channel.
- Protecting the computer is very difficult. Even if kept in a highly secure environment, programmers and operators will still have access to sensitive files. Good employee screening will decrease the risk but will not eliminate it.
- Communications channels can be passively or actively wiretapped. Passive refers to reading data. Active refers to altering or inserting data.

- Simple direct line computer-to-computer communications are the easiest to penetrate.
 - Shared packet networks are much more difficult to penetrate, since much of the data is "sliced" and shipped in a mixed mode by the system.
 - Penetrating a network requires a great deal of technical knowledge; this knowledge is not very widespread.
 - A very strong incentive is required to penetrate a network.
- One of the best answers to the problem of terminal passwords is to have a system in which users can assign their own password and can change them at any time. The user can generally assign a password that is easy to remember and won't have to be written down. Such a password can be easily changed if one suspects that it might be known to another party.
 - Some networks are designed so that user names and passwords may only be used from designated nodes or terminals. This also reduces the risk.
 - Cryptography at the sending and receiving terminal provides the highest level of security in an IEDE system.
- Cryptography at the terminals eliminates any security risk at the computer or in the communications channels since data will never appear in the clear.
 - The terminal in an encrypted system becomes the only weak element, but it can be protected through several means.
 - The best protection is to store the encryption key in the terminal's volatile memory and interlock it with the chassis. Penetration of the terminal will destroy the key.

- INPUT recommends that users who need the highest degree of security in their system employ the ANSI X9.9-1982 standard for encryption, also known as FIMAS (Financial Institutions Message Authentications Standard). FIMAS is based on the National Bureau of Standards (NBS) Data Encryption Standard (DES).
- IS managers that want to ensure high security should also consider retaining an expert in the field. Also, a number of good texts are available on the subject.
- Data encryption can cause problems in international communications, since many foreign agencies monitor communications passing through their jurisdictions and do not allow encrypted data to pass across their borders.
 - This problem may be addressed by only encrypting a few bytes that will authenticate the message.
 - This process can ensure that no one has intercepted and altered the data and that it is an authorized message.
- A final word on security: Caution should be exercised to prevent "wrongful dishonor," which is the refusal to honor a legitimate correspondent's transaction.
 - Such action can result in bad publicity, lawsuits, and financial rewards for damages.
 - The harm done may be greater than that resulting from unauthorized access to the system.

D. FORM AND CONTENT STANDARDS

- One of the key issues that must be resolved before intercompany electronic data exchange can be affected is the creation and agreement on standards for the form and content of the data.
 - Protocols and standards are fairly well established for the physical linking of data processing equipment.
 - Form and content standards are less prevalent and much more difficult to implement.
- INPUT has presented many examples in this report and cited the bodies responsible for establishing standards. This was done so that readers may know the sources if they wish to adopt a particular standard for their application.
- If one wishes to implement an IEDE application for a specific function within an industry but is not aware of an existing standard, that person should check with industry trade groups to see if a standard has been developed or is being worked on.
- Standards may also be developed by function-specific groups, such as purchasing agents or distribution managers. These people may help in finding standards.
- If standards are not found, the IS manager may be able to inspire the company or interested department into spearheading an effort to develop standards.
 - Industry- or function-specific groups are useful vehicles for getting this effort underway.

- The major companies in an industry can also establish the leadership necessary to create new standards.
- The American National Standards Committee has been involved in the development of many major form and content standards, so they should be consulted on this subject.
- A great deal of work remains to be done in establishing standards.
 - Much of that work will be accomplished in the next five years.
 - As this work is completed, American business practices will be revolutionized.

E. RELIABILITY AND BACKUP

- Reliability of the IEDE system should be a critical concern of the IS manager. Even so-called noncritical applications tend to become critical once users become dependent on them. This is especially true when customers or suppliers are involved in the system.
- Backup is a very important consideration. IEDE introduces substantial efficiencies into operations.
 - At some point, the increased efficiencies and new procedures involved with using IEDE often make it impossible to go back to the old method when the new method is unavailable.
 - Almost certainly, being denied access to the system will result in significant operating cost compared to the older alternative.

- Eventually, IEDE systems will become very integral to the operations of a company. Dependency on some applications will become so great that if the system goes down, major operations will also go down.
- IEDE systems tend to be placed in critical and important applications. This further compounds the problem of reliability and backup.
- IS managers should take a long view of the establishment of an IEDE system and should be concerned about the impact of problems three to five years in the future, as well as on the first day of use.
- Another point in favor of using public VANs in an IEDE is VANs' recognized reliability and backup features. One of the stated reasons the insurance industry selected IBM for its IVAN system was because IBM had better backup facilities.

VI PROMOTING THE IEDE SYSTEM

A. WHO WILL PAY FOR IT?

- One of the frequently encountered problems of IEDE is who will provide funding and who will pay for continuing operations.
- The CARDIS system mentioned earlier has foundered at the pilot stage, largely because of difficulties in finding sponsors willing to fund the full implementation of the system.
 - The size and cost of major systems like CARDIS are frequently beyond the means of many companies or even groups of companies.
 - Sharing of the expense on a broad basis, as with the airlines' SITA system, is often the only solution.
 - In some cases IEDE systems can be established on a regional basis at a lower cost. An example is the ATM networks, which will eventually link together into a national network.
- Implementation cost can be greatly reduced if a public VAN can be used in the system. This savings may make the difference in funding the project.

- Cooperative efforts of trade or other special interest groups are also cost effective.

B. USER ACCEPTANCE

- A corollary funding problem is user acceptance and payment.
- There is substantial controversy in the retail industry about who should pay for debit card transactions.
 - Bankers feel that the retailer should pay for the service because retailers are getting guaranteed payment, which retailers do not always get with checks.
 - Retailers feel that bankers should pay for this service because to retailers payment is similar to that for a check; retailers pay no processing fees for checks. Furthermore, it costs banks a lot less to process an electronic transaction than it does to process a paper check.
 - Some retailers operate on very narrow profit margins and feel they cannot afford the 2.5-5% fee charged by banks.
- A group of Seattle merchants has filed an antitrust suit against a local bank because the bank is trying to force them to accept debit as well as credit cards.
- Another problem with user acceptance of an IEDE system is that some users may benefit more than others; these others will dispute IEDE's implementation.

- The Securities and Exchange Commission ordered an electronic link between seven stock exchanges and the over-the-counter market. This link met serious user resistance.
- Some users resisted the system because they felt that it gave an unfair trading advantage to other users who made markets in the stocks that were to be traded in the pilot test. This user resistance held up implementation of the system for almost a year.
- A similar problem caused a long delay in the implementation of IVAN in the insurance industry.
 - Implementation required the cooperation of competing companies.
 - Companies were concerned about losing their competitive edge or giving an edge to a competitor with whom they had implemented the system.
- The banking industry is very concerned about the implementation of debit card networks because much of banking's assets are concentrated in demand deposits that back the debit cards.

C. BENEFITS

- Probably the most vital issue concerning IEDE applications is who benefits from them.
- Some IEDE systems produce substantial changes in the way a company does business.

- The IS manager should be particularly wary of the political problems that can arise through user reluctance to use a system the user has paid millions of dollars to acquire.
 - The IS manager may not be responsible for this type of problem, but nevertheless may not be held blameless.
 - The IS manager, simply as a matter of prudence, should question all aspects of such a project.
- As part of the justification of an intercompany electronic data exchange system, the benefits to all parties should be clearly identified.
 - Similarly, the potential harmful effects must be examined.
 - In all cases, any change in the basic methods of doing business must be carefully reviewed and analyzed.
- There are many benefits to be derived from IEDE, but the IS manager must recognize that IEDE is more of a revolutionary than an evolutionary process.
- A few final words on benefits:
 - It may be useful in exploring the possibilities of IEDE to look at what one's company can output rather than input to an IEDE.
 - One's own data base may be the best starting point.
 - Think about all those invoices sent out every month.
 - Consider the number of purchase orders handled.

- Think about the countless number of expensive clerical chores that could be eliminated.
- Count the potential savings.

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